Serial No._____

INSTRUCTION MANUAL

MODELS
1001A to 1005
SWEEP/SIGNAL GENERATOR

WAVETEK INDIANA INC.

66 N. FIRST AVENUE, P.O. BOX 190

BEECH GROVE, INDIANA 46107

317-783-3221

WARRANTY

All Wavetek instruments are warranteed against defects in material and workmanship for a period of one year after date of manufacture. Wavetek agrees to repair or replace any assembly or component (except batteries) found to be defective, under normal use during this period. Transfermatic Switch assemblies, manufactured by Wavetek, are unconditionally warranteed for the life of the instrument. Wavetek's obligation under this warranty is limited solely to repairing any such instrument which in Wavetek's sole opinion proves to be defective within the scope of the warranty when returned to the factory or to an authorized service center. Transportation to the factory or service center is to be prepaid by purchaser. Shipment should not be made without prior authorization by Wavetek.

This warranty does not apply to any products repaired or altered by persons not authorized by Wavetek, or not in accordance with instructions furnished by Wavetek. If the instrument is defective as a result of misuse, improper repair, or abnormal conditions or operations, repairs will be billed at cost.

Wavetek assumes no responsibility for its product being used in a hazardous or dangerous manner either alone or in conjunction with other equipment. High voltage used in some instruments may be dangerous if misused. Special disclaimers apply to these instruments. Wavetek assumes no liability for secondary charges or consequential damages and, in any event, Wavetek's liability for breach of warranty under any contract or otherwise, shall not exceed the purchase price of the specific instrument shipped and against which a claim is made.

Any recommendations made by Wavetek for use of its products are based upon tests believed to be reliable, but Wavetek makes no warranty of the results to be obtained. This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to represent or assume for Wavetek any liability in connection with the sale of our products other than set forth herein.

Contents

SECTION 1—*GENERAL INFORMATION*
- 1.1 INTRODUCTION
- 1.2 SPECIFICATIONS
- 1.3 OPTIONS
- 1.4 ACCESSORIES

SECTION 2—*INSTALLATION*
- 2.1 MECHANICAL INSTALLATION
- 2.2 ELECTRICAL INSTALLATION

SECTION 3—*OPERATING INSTRUCTIONS*
- 3.1 INTRODUCTION
- 3.2 DESCRIPTION OF FRONT PANEL
- 3.3 DESCRIPTION OF REAR PANEL
- 3.4 TYPICAL OPERATING SET-UP
- 3.5 SPECIAL OPERATING NOTES
- 3.6 PROGRAMMING

SECTION 4—*CIRCUIT DESCRIPTION*
- 4.1 INTRODUCTION
- 4.2 SIMPLIFIED BLOCK DIAGRAM
- 4.3 POWER SUPPLY
- 4.4 SWEEP RATE (MODULE M1H)
- 4.5 SWEEP DRIVE (MODULE M2G)
- 4.6 SWEEP OSCILLATOR FOR MODEL 1001A and 1002 (MODULE M9G and M9H)
- 4.7 OUTPUT AMPLIFIER FOR MODEL 1001A and 1002 (MODULE M10F and M10G)
- 4.8 SWEEP OSCILLATOR FOR MODEL 1003, 1004, and 1005 (MODULE M9R, S, and T)
- 4.9 MARKER ADDER (MODULE M5G)
- 4.10 MARKERS (MODULE M6's)

SECTION 5—*MAINTENANCE*
- 5.1 INTRODUCTION
- 5.2 SERVICE INFORMATION
- 5.3 PERFORMANCE CHECKS
- 5.4 CALIBRATION PROCEDURE
- 5.5 TROUBLESHOOTING

SECTION 6—*SCHEMATICS & PARTS LIST*
- 6.1 INTRODUCTION
- 6.2 MANUFACTURERS CODE
- 6.3 SCHEMATIC NOTES
- 6.4 ABBREVIATION CODE

SCHEMATICS AND PARTS LIST

CHANGE INFORMATION, IF ANY, IS LOCATED AT THE REAR OF THIS MANUAL

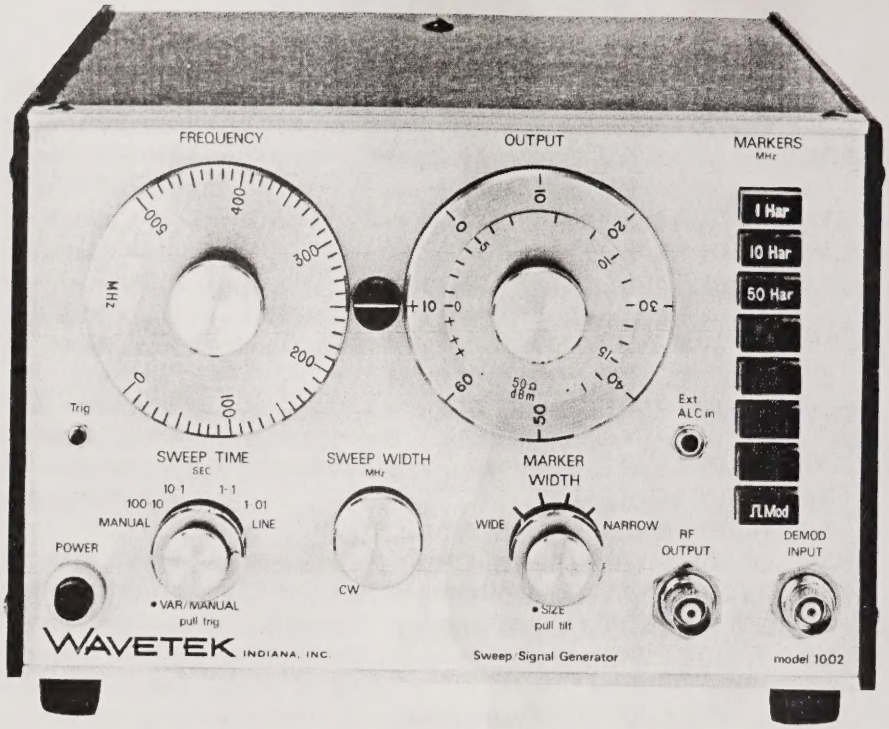


FIGURE i—MODEL 1002 SWEEP/SIGNAL GENERATOR

SCOPE OF THIS MANUAL

This manual provides descriptive material and instructions for the installation, operation, maintenance, and repair of the WAVETEK Model 1001A to 1005 Sweep/Signal Generator.

SECTION 1
GENERAL INFORMATION

1.1 INTRODUCTION

The Wavetek 1000 Series Sweep/Signal generators are single band instruments covering the frequency range from 500 KHz to 1.4 GHz. All units utilize the same, Front Panel, Harness and Power Supply with the balance of the circuits contained in Plug-In Modules. However, it is not intended that one model be converted to another. The plug-in concept simplifies maintenance problems and provides marker circuits which can be customized to specific applications. A Rear Panel Connector permits remote programming of Center Frequency, Sweep Width and Output Level, plus, External Amplitude and Frequency Modulation.

1.2 SPECIFICATIONS

TABLE 1-1. SPECIFICATIONS

RF SPECIFICATIONS

MODEL	1001A	1002	1003	1004-1	1004	1005	
Frequency Range	0.5 to 300	1.0 to 500	350 to 650	450 to 950	500 to 1000	700 to 1400	MHz
Sweep Width MAX	300	500	300	500	500	700	MHz
Sweep Width MIN	200	200	300	400	400	500	KHz
Maximum Output	+13	+13	+13	+10	+10	+10	dBm
Flatness (Note 1)	±0.25	±0.25	±0.25	±0.25	±0.25	±0.5	dB
Frequency Dial Calibration Intervals	10	10	10	10	10	20	MHz
Freq. Dial Accuracy	±3 MHz	±5 MHz	1% (Note 2)	1% (Note 2)	1% (Note 2)	1% (Note 2)	———
Display Linearity	2	2	2 (Note 2)	2 (Note 2)	2 (Note 2)	2 (Note 2)	%
Frequency Drift 5 MIN.	100	100	50	100	100	200	KHz (Note 3)
Frequency Drift 8 HR.	2	2	2	2	2	4	MHz (Note 3)
Residual FM	15	15	10	10	10	20	KHz
Spurious — Harmonics	30 (10 to 300 MHz)	26 (10 to 500 MHz)	26 (380 to 650 MHz)	26 (500 to 950 MHz)	26 (550 to 1000 MHz)	26 (800 to 1400 MHz)	dB below output
Spurious — Non-Harmonics	40	40 to 300 MHz, 30 to 500 MHz	—	—	—	—	dB below output

NOTE 1 Flatness is read with a Negative Half-wave Detector. If flatness is read with a power meter, flatness will be approximately 2 times negative detector specifications.

NOTE 2 Linearity and Dial accuracy are measured at full output, as additional errors can occur due to frequency pulling from the 0-20db vernier attenuator. This pulling effect is typically less than 1% of frequency.

NOTE 3 Drift is measured after 1 hour warm-up and constant ambient temperature and allowing a 5 minute stabilizing period after a frequency change.

NOTE 4 An output impedance of 75 ohm is available on instruments up to 1000 MHz and provides the same performance. The output system is calibrated in dBmV (0dB REF is 1MV). Maximum output of units providing +13dBm into 50 ohm would be +60dBmV into 75 ohm. Units having a maximum output of +10dBm into 50 ohm, would provide +57dBmV into 75 ohm.

TABLE 1-1. Specifications (Con't.)

Blanking	Retrace blanking of the RF output is provided for sweep operation and removed for CW operation.
Output Impedance	50 ohm standard, 75 ohm optional (see Note 4).
Attenuation	0 to 70dB in 10dB steps 0 to 20dB vernier, calibrated in 1dB intervals.

ACCURACY OF STEP ATTENUATOR	ACCURACY OF VERNIER ATTENUATOR
±0.5dB to 500 MHz	±0.5 dB to 500 MHz
±1.0dB to 1000 MHz	±1.0dB to 1000 MHz
±2.0dB to 1400 MHz	±2.0dB to 1400 MHz

Vernier Frequency Control	±1% of frequency range.

REMOTE PROGRAMMING

A Rear Panel REMOTE Jack provides necessary connections for Remote Control of Frequency, Sweep width and the 0 to 20 dB Vernier output control. This jack also provides connections for EXTERNAL Amplitude and Frequency Modulation.

Frequency	May be remotely programmed by a ±16 volt signal (−16 volts corresponds to LOW frequency band end and +16 volts to HIGH frequency band end).
Sweep Width	May be controlled by a remote potentiometer, (Input and output connections provided in Rear Panel REMOTE jack).
Vernier 0-20dB Output	May be remotely programmed over a 20dB range with a 0 to −18 volt signal (−18 volts corresponds to maximum output).
External FM	The full frequency range can be swept at rates up to 4 kHz. With reduced Deviation and Linearity, modulation rates to 100 kHz are possible.
External AM	External AM signals are applied to the same connections as for vernier 0-20dB control. Therefore, vernier range must be restricted so the 0 to −18 volt range is not exceeded or distortion will occur. With average voltage set to mid-range, 100% modulation is obtainable up to 1 kHz, 40% modulation is obtainable up to a 40kHz rate.

SWEEP SPECIFICATIONS

Sweep Modes	Repetitive sweep Single sweep Externally triggered sweep Manual sweep Line-lock sweep
Sweep Time	Continuously variable from less than 10ms to over 100 seconds, in 4-decade steps, plus vernier.
Horizontal Output	16 volts peak-to-peak (symmetrical about ground)

TABLE 1-1. Specifications (Con't.)

EXTERNAL LEVELING

External Monitor (ALC)	An external negative signal, between 0.2 and 2 volts, may be used to level the RF output. The ALC front panel input jack mates with Switchcraft type 750 plug.

MARKER SPECIFICATIONS

Type	Birdy by-pass markers with provisions for 8 plug-in marker modules, plus, rear panel external marker input. Markers may be either single frequency or harmonic (comb) type. (See Options A-1 and A-2)
Accuracy	0.005%
External Marker Input	Rear Panel BNC connector accepts external CW signal for conversion to a Birdy marker. Input level: 100mV into 50 ohms.
Marker Width	Adjustable from (approx.) 15 to 400 kHz in four steps.
Marker Size	Adjustable from (approx.) 1V to 1mV peak-to-peak.
Rectified Birdy	Internal switch removes the negative portion of the birdy marker for use with X-Y recorders. Size varies with detector's impedance. Adjustable from (approx.) 6 volt to 1mV with detector impedance of 1 meg ohm, or from 0.5V to 1 mV with detector impedance of 0 ohms.
Marker Tilt	Provides horizontal markers with a size equal to approximately 10% of horizontal display. Adjustment of marker size vectorily adds the normal vertical marker to the horizontal marker, causing the resulting marker to vary from a horizontal position toward a vertical position.

POWER REQUIREMENTS

Line Supply	115 or 230 VAC ± 10%, 50 to 60 Hz, (approx. 20 watts)

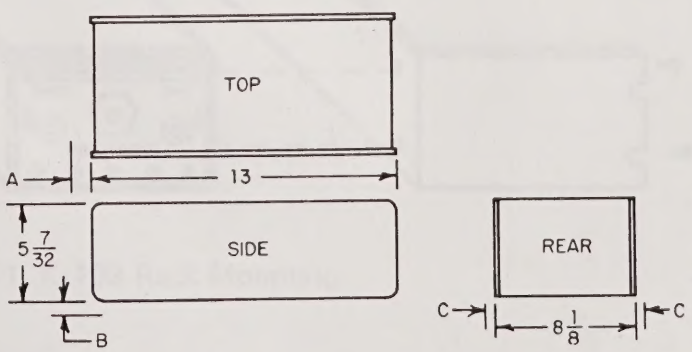
MECHANICAL SPECIFICATIONS (See Figure 1-1.)

A For total length, including knobs, add 11/16 inch

B For total height, including feet, add 5/8 inch

C For total width, including screw heads, add 3/16 inch

Weight
Net— 19 lbs.
Shipping—25 lbs.



1.3 OPTIONS

1.3.1 Marker A-1. Any single frequency between 1 to 1400 MHz.

1.3.2 Marker A-2. Harmonic type at 1, 10 or 50 MHz. (Other frequencies available on special order.)

1.3.3 Modulator A-4. Provides 100% amplitude modulation at a 1 kHz rate.

1.3.4 Penlift A-5. Provides contact closure during sweep time.

1.4 ACCESSORIES

1.4.1 Accessories furnished: Instruction Manual and Plug to mate with Rear Panel REMOTE jack.

1.4.2 Accessories Available:

a. Wide-band RF Detector	Model D-151 for 50 ohm applications up to 1000 MHz. Model D-152 for 50 ohm applications up to 1400 MHz. Model D-171 for 75 ohm applications up to 1000 MHz.
b. Service Kit	K102. Contains a module extender and extension cables.
c. Rack Mount Kit	K103. Mounts single instruments in a 5½ inch space. See figure 2-1.
d. Rack Mount Kit	K104. Mounts one or two instruments in a 7 inch space. See figure 2-2.

SECTION 2
INSTALLATION

2.1 MECHANICAL INSTALLATION

2.1.1 Initial Inspection

After unpacking the instrument, visually inspect the external parts for damage to knobs, connectors, surface areas, etc. The shipping container and packing material should be saved in case it is necessary to reship the unit.

2.1.2 Damage Claims

If the instrument is received mechanically damaged in transit, notify the carrier and either the nearest Wavetek area representative or the factory in Indiana. Retain the shipping carton and packing material for the carrier's inspection.

The local representative, or the factory, will immediately arrange for either the replacement or repair of your instrument, without waiting for damage claim settlements.

2.1.3 Rack Mounting

The instrument is 1/2 rack size and two rack mounting kits are available. The K-103 kit provides the necessary hardware to mount the unit to either the right or left of a standard 5¼" x 19" opening. The K-104 kit provides the necessary hardware to rack mount two instruments. These may be two 1000 or 2000 series Wavetek, Indiana Instruments, or two 130 or 140 series Wavetek, San Diego Instruments, or a combination of either. This provides a 7" x 19" package. Facilities are provided for Front Panel mounting of instrument Rear Panel connectors.

2.1.4 K-103, Rack Mounting Kit (Refer to Figure 2-1)

CONTENTS

Item	Qty.	Part No.
A (Side)	1 ea.	B000-608
B (Side)	1 ea.	C000-610
C (Screw)	8 ea.	HS101-806

Procedure:

Remove the screws from one side panel at a time. Mount item A or B against the side panel of the instrument and secure with screws provided (item C). Repeat operation for other side. NOTE: Items A & B may be interchanged to position the unit to the side of the rack desired.

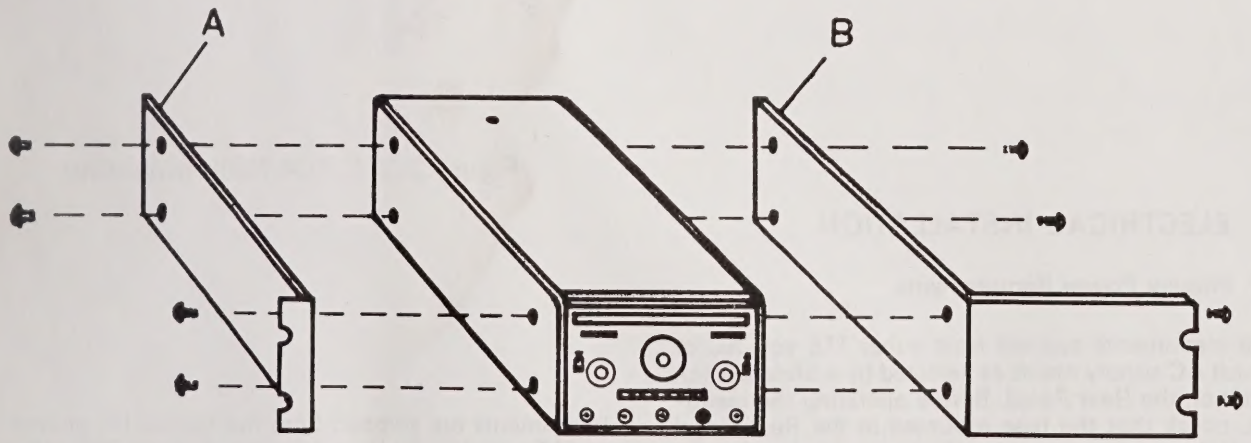


Figure 2-1. K-103 Rack Mounting

2.1.5 K-104 Rack Mounting Kit (Refer to Figure 2-2)

CONTENTS

Item	Qty.	Part No.
A (Tray)	2 ea.	C000-729
B (Side)	2 ea.	A500-230
C (Screw)	12 ea.	HS101-903

Procedure:

Install both sides (item B) to one tray (item A) using 10-32 x 3/16" screws (item C). Position the instrument on the tray so that the feet extend into the provided holes. Holes are provided for all Wavetek, Indiana 1000 and 2000 series and for most Wavetek, San Diego 130, 140, and 700 series instruments. Other instruments not exceeding 5¼" x 8" may also be mounted by drilling additional holes for their feet.

When one or both instruments are properly seated, install the other item "A" and secure with the remaining screws (item C).

NOTE: If the Wavetek instrument has been supplied with a bail, it must be removed before installing in the K-104 rack mounting kit.

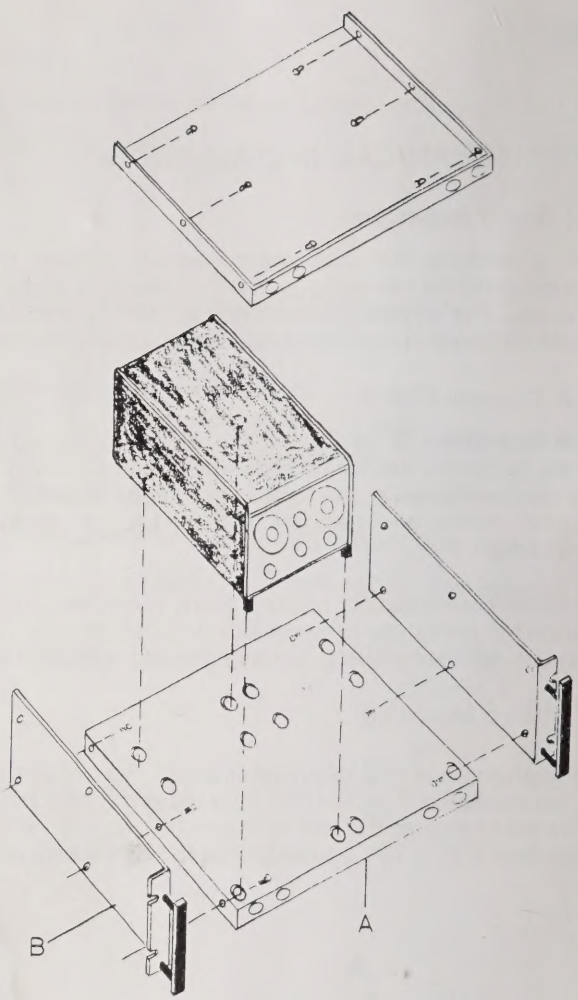


Figure 2-2. K-104 Rack Mounting

2.2 ELECTRICAL INSTALLATION

2.2.1 Primary Power Requirements

These instruments operate from either 115 volt AC or 230 volt AC supply mains as selected by a Slide Switch located on the Rear Panel. Before operating the instrument, check that the fuse mounted in the Rear Panel Fuse Holder corresponds to the correct value for the selected voltage; i.e., 0.5 amp for a 115 volt AC, and 0.25 amp for 230 volt AC.

The power supply has been designed to operate from either 50 or 60 Hz supply mains, however, the line operated sweep rate function must be adjusted to the line frequency.

Instruments are shipped from the factory for operation at 115 volt AC, 60 Hz unless specified for 230 volt AC or 50 Hz operation.

2.2.2 Performance Checks

The electrical performance of this instrument should be verified. Performance checks for incoming inspection are given in Section 5, Maintenance.

SECTION 3
OPERATING INSTRUCTIONS

3.1 INTRODUCTION

This section provides complete functional control description, operating instructions, and programming instructions for the 1000 Series Sweep/Signal Generators.

In addition, special operating notes cover sweep rate errors, overloading, low level measurements and operation with networks analyzers and X-Y plotters.

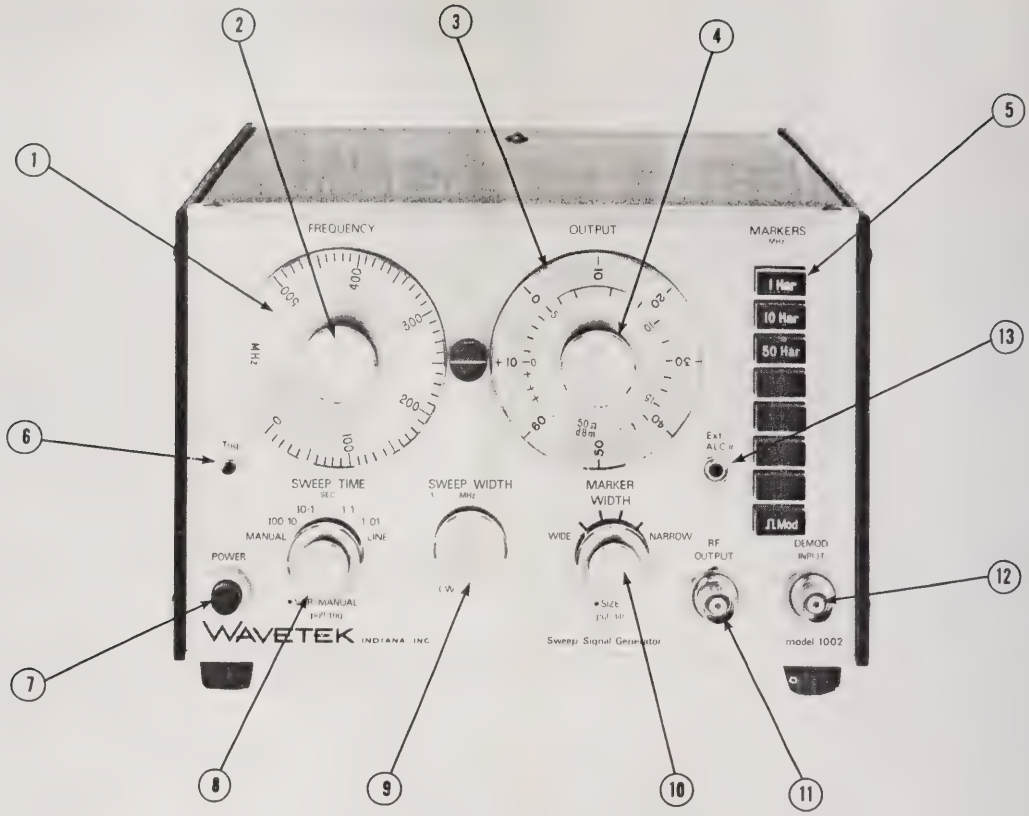


Figure 3-1. Front Panel

3.2 DESCRIPTION OF FRONT PANEL

① FREQUENCY (Coarse)	A center frequency tuning control.
② FREQUENCY (Vernier)	Provides approximately a ±1% adjustment of the tuning range. NOTE: The coarse control will be calibrated when the calibration line of the vernier knob is aligned with the frequency indicator.
③ OUTPUT (Step)	Provides calibrated adjustment of the RF output in 10dB increments, from +10dBm to −60dBm.
④ OUTPUT (Vernier)	Provides a 20dB vernier adjustment of the RF output. Calibrated in 1dB increments.
⑤ MARKERS—(MHz)	Eight, push button switches control A-1 and A-2 Marker Options (Marker frequency is engraved on push button). The eighth button also controls Modulation Option A-4.
⑥ TRIG	Momentary contact switch, triggers the sweep in the triggered mode for single sweep operation.
⑦ POWER	Push Button, applies A.C. power to the power supply. The light indicates that the instrument is operating.

⑧ SWEEP TIME Sec. VAR/MANUAL Control PULL TRIG	This is a six position Switch/Control. The Outer knob provides selection of MANUAL, LINE, or Four Decade Ranges of Variable sweep time. The Inner knob provides manual frequency sweeping when SWEEP TIME Sec. switch is set to MANUAL, and variable adjustment of sweep time in each of the four decade ranges. The sweep may be changed from recurring to triggered by pulling the knob out. (The sweep may be triggered in the four decade ranges only).
⑨ SWEEP WIDTH	Control logarithmically adjusts the displayed sweep width. Full counterclockwise rotation will switch the instrument to a Continuous Wave mode of operation.
⑩ MARKER WIDTH SIZE PULL TILT	Dual Concentric Control; Outer knob adjusts marker width from 15 to 400 KHz, in four steps; Inner knob controls marker size, and when pulled out activates the marker TILT feature. When the marker TILT is activated, full counter-clockwise rotation of the control will provide horizontal markers with an amplitude of approximately 10% of the total horizontal display. Clockwise rotation will produce a varying amount of tilt toward the vertical axis.
⑪ RF OUTPUT	BNC connector provides a connection for the RF output signal.
⑫ DEMOD INPUT	BNC connector accepts the demodulated swept signal from the device under test, so that RF markers may be added. (The combined signal is available at the SCOPE VERT connector on the rear panel).
⑬ EXT. ALC in	Phone jack connector accepts an automatic leveling control signal from a remote monitor, and disconnects the internal ALC loop. (mates with Switchcraft type 750 plug)

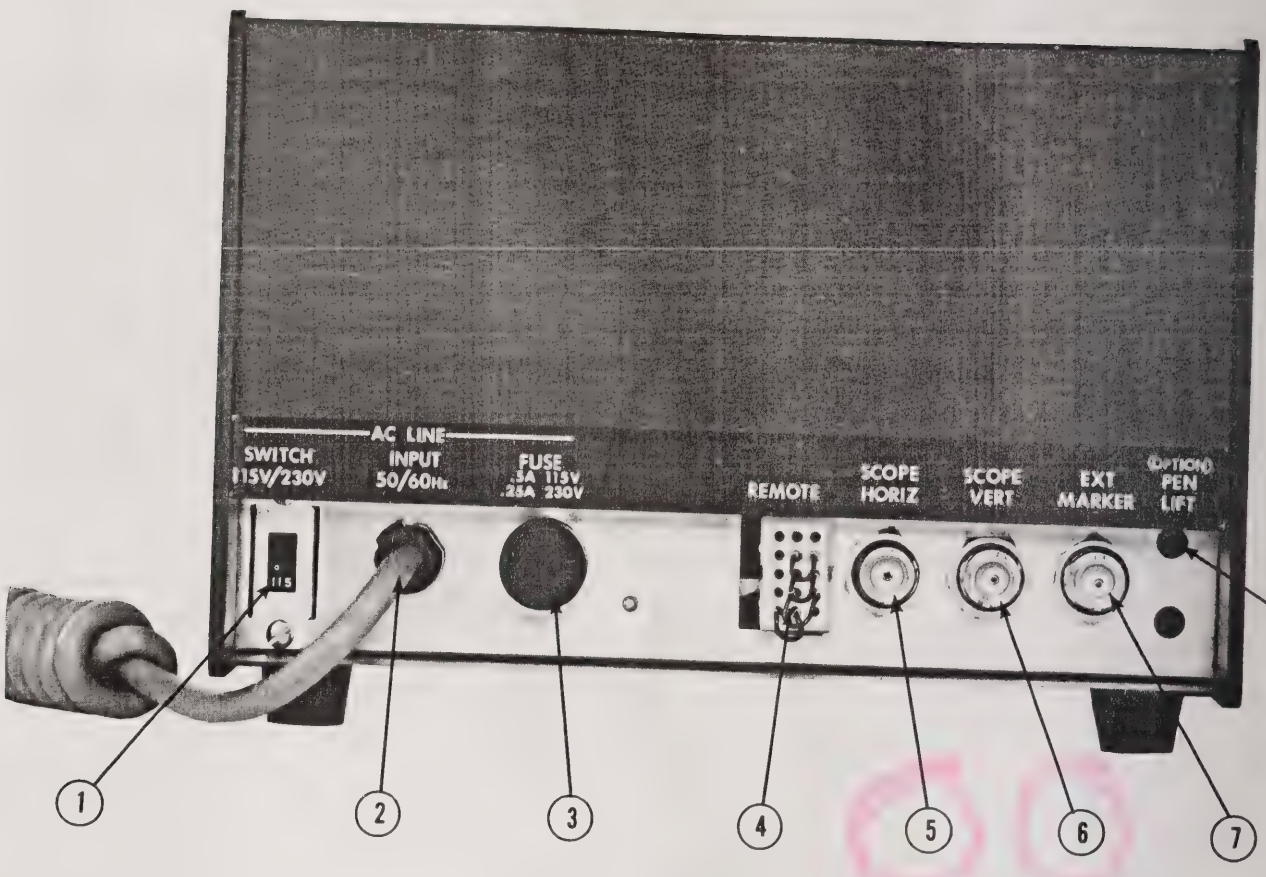


Figure 3-2. Rear Panel

3.3 DESCRIPTION OF REAR PANEL

① SWITCH 115/230 volt	Selects 115 or 230 volt line voltage.
② INPUT 50/60Hz	3 prong AC plug provides connection to AC mains.
③ AC LINE FUSE	0.5A for 115 volt AC or 0.25A for 230 volt AC.
④ REMOTE Jack	Provides connection for programming of frequency, sweep width and RF output level. (See paragraph 3-6 for detailed instructions). This jack is supplied with a mating "jumpered plug" which provides Front Panel control.
⑤ SCOPE HORIZ. Jack	BNC jack provides connection to (X) axis of oscilloscope or plotter.
⑥ SCOPE VERT. Jack	BNC connector provides the combined markers and demodulated RF (when Front Panel DEMOD INPUT is connected) for connection to the oscilloscope Vertical (Y) axis input.
⑦ EXT. MARKER Jack	BNC connector accepts an externally generated Continuous Wave signal to produce a frequency marker on the display.
⑧ (OPTION) PEN LIFT	When Pen Lift Option is installed, these 2 terminals provide *contact closure* during sweep "ON" time. This option operates only when the Front Panel SWEEP TIME Selector is set to the 100-10 SEC. position.

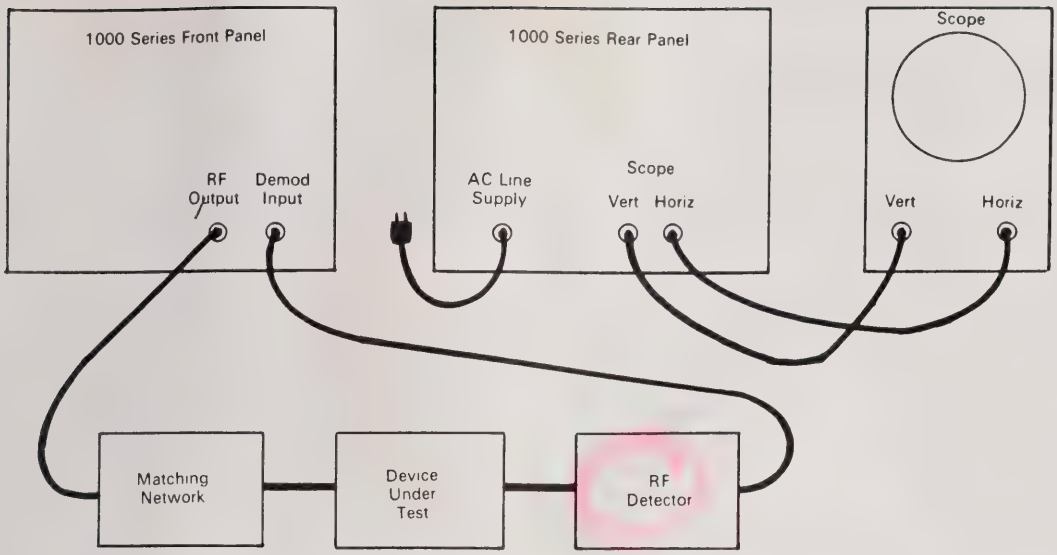


Figure 3-3. Typical Operating Set-up

3.4 TYPICAL OPERATING SET-UP

When initially setting up instrument, first check Rear Panel AC LINE VOLTAGE Selector Switch and Fuse to insure the instrument is set for operation with the available AC mains.

Make connections between the Sweep Generator, the device under test, and the oscilloscope as shown in Figure 3-3. Since Hum, RF leakage, and Spurious signal pick-up must be kept to a minimum, it is essential that good connections and grounds be maintained throughout the entire set-up. Use coaxial cables with BNC connectors wherever possible. The RF OUTPUT cable is especially critical. It should match the output impedance of the sweep generator and should be kept as short as practical (under 3 feet). If the input impedance of the device under test is not the same as the sweep generator output impedance, a matching network, as shown in Figure 3-3, should be used to insure a constant amplitude input signal to the device under test.

After the RF signal passes through the RF circuit, of the device under test, it must be demodulated before being connected to the DEMOD IN of the Sweep Generator. If a demodulator is not a part of the device under test, one must be added externally. (See Figure 3-3). The input impedance of the demodulator must present the proper load to the RF circuit being tested. The Wavetek Model D151 or D152 RF Detector is recommended for 50-ohm applications and the Model D171 for 75 ohm applications.

Depress the POWER push-button. The light in the switch button should light, indicating an operating condition.

(NOTE: This instrument does not require a warmup period unless it is to be used at the extreme limits of its specifications.)

After completing the set-up, adjust the Sweep Generator controls for the required Center Frequency, Sweep Width, Output Amplitude, and Sweep Rate. Turn the desired markers On, and adjust their Size and Width.

3.5 SPECIAL OPERATING NOTES

3.5.1 Errors From Sweep Rate Effects

When sweeping RF circuits having rapid amplitude changes, errors may occur, due mainly to detector delays. Decreasing the detector output time constant will minimize this effect. Figure 3-4 illustrates sweep rate effect.

To check for sweep rate effect, first set the sweep width to its lowest practical amount, then reduce sweep time while closely observing the swept output response. Any change in the response indicates the sweep rate is too fast for a true response. When a further reduction of sweep time does not change the response, a true response has been obtained.

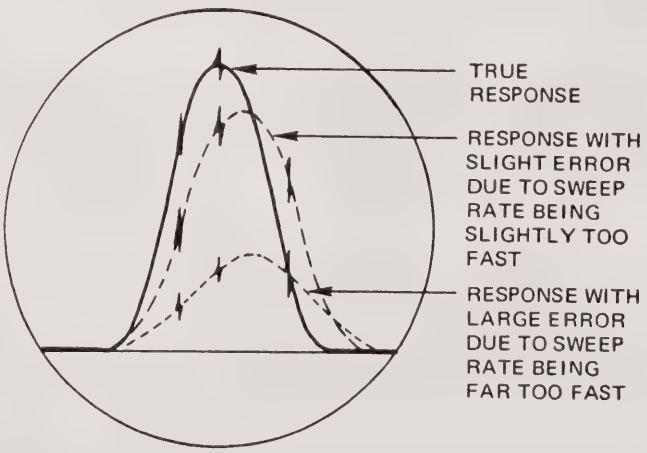

TRUE RESPONSE
RESPONSE WITH SLIGHT ERROR DUE TO SWEEP RATE BEING SLIGHTLY TOO FAST
RESPONSE WITH LARGE ERROR DUE TO SWEEP RATE BEING FAR TOO FAST

Figure 3-4. Sweep Rate Effects

3.5.2 Effects From Overloading

The use of excessive input signals to the device under test can cause overloading. To assure that this condition is not present, and that the response is a true representation of the device under test, turn the OUTPUT dbm controls to minimum output amplitude. Gradually increase the output amplitude until a response is obtained. Further increase of the output amplitude should not change the configuration of the response envelope except in amplitude. If the response envelope does change, such as flattening at the top, decrease the output just far enough to restore the proper configuration.

3.5.3 Making Measurements At Low Levels

When making measurements at low levels, radiation and ground loops become problems. Using double shielded cables for cables carrying RF signals helps minimize the radiation problem. Ground loops causing hum pick-up can sometimes be eliminated by completing only one ground connection between each instrument. This applies particularly to the scope horizontal input. If the ground connection is made at the vertical input terminal, an additional ground at the horizontal input terminal will often result in hum pick-up.

3.5.4 Operation With X-Y Plotters

Two features are incorporated into the 1000 Series Sweep Generators to facilitate operation with X-Y plotters. First, a Marker Clamp Switch converts the hi-frequency marker signals to a lower frequency which is compatible with the operating speed of the plotter pen. This is an internally operated switch located directly behind the front panel DEMOD input jack, and is accessible by removing the instrument bottom cover.

Second, is an optional feature (A-5). This feature provides a Contact Closure during the sweep time, to operate the plotter's Pen Lift. The A-5 feature operates only when the Sweep Time selector switch is set to its slowest position, 10 to 100 sec.

3.5.5 Operation With Network Analyzers

To operate properly with certain network analyzers several modifications might be required. Some analyzers require the removal of the blanking signal during the sweep return trace. This can be accomplished by disconnecting the single wire connected to pin 10 of the M1H Module. Another modification sometimes required is to provide a horizontal output ramp that varies from zero to some positive voltage instead of the standard −8 to +8 volt ramp. This can be accomplished by connecting a 56 K ohm resistor between pins 2 and 11 of the M1H Module. This connection provides a horizontal output signal from approximately 0 to 11 volts.

3.5.6 Operation With An External Monitor

Operation with an External Monitor can produce a flatter (less amplitude variation) input signal, to the device under test, than is obtainable with the internal monitor. The external monitor point is located at the point where greatest flatness is desired, and is not affected by cable VSWR or input impedance of the device under test. Another application, is to level at the output point of a Wide Band Power Amplifier, in order to increase the output power capability of the sweep generator.

To operate with an external monitor; First, set the OUTPUT controls for maximum. Next, connect the output from the External Monitor to the Front Panel phone jack labeled ALC IN. The signal from the external monitor must be of a negative polarity between 0.2 and 2 volts. If the signal is larger than 2 volts, use a resistive divider to obtain less than 2 volts, While observing the output from the monitor on an oscilloscope, adjust the Vernier OUTPUT Control until the monitor signal becomes leveled. (Refer to Figure 3-5).

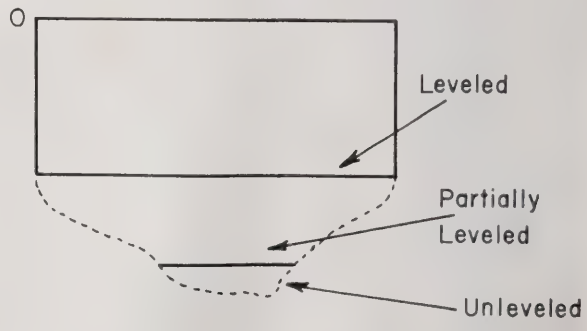
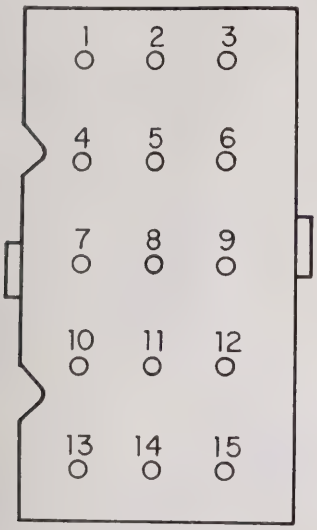


Figure 3-5.

3.6 PROGRAMMING

Connections for remote operation of OUTPUT AMPLITUDE, FREQUENCY and SWEEP WIDTH plus EXTERNAL AM and FM MODULATION and triggering of the sweep circuit is provided by a Rear Panel REMOTE programming connector. The programming jack and its pin functions are shown below.



Rear Panel
Remote Jack J 101

VOLTAGE AND SIGNAL SOURCES

Pin 1—Ground
Pin 2—+16 volts
Pin 3—−16 volts
Pin 4—−18 volts
Pin 10—Ramp for Driving Sweep Width Control

CONTROL INPUTS

Pin 6—Output Level Control (AM Modulation)
Pin 7—Sweep Time, Trigger Input
Pin 9—Frequency Control
Pin 12—Sweep Width Control (FM Modulation)
Pin 14—Sweep Width Control Ground

INTERNAL CONTROL

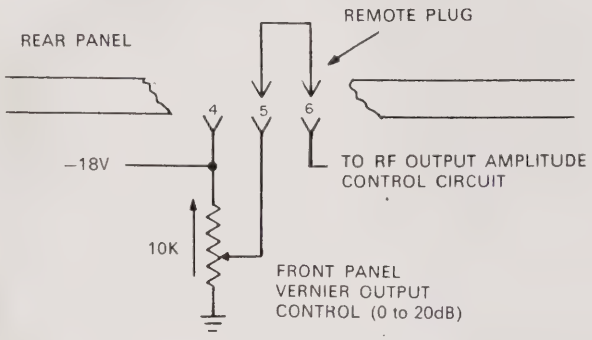
Pins 5, 8, 11 and 13 are used to program internal operation of Output, Frequency and Sweep Width.

UNUSED

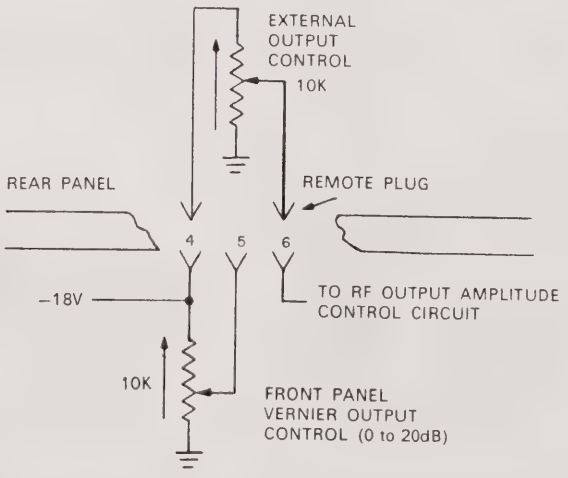
Pin 15 is unused.

3.6.1 OUTPUT AMPLITUDE CONTROL (AM MODULATION)

Normal internal control is provided by a jumper wire connected between pins 5 and 6 of the REMOTE plug as shown below.



To provide external control, remove jumper wire and connect an external OUTPUT Control as shown below. The RF OUTPUT is a linear function of the programming voltage as shown in Figure 3-6.



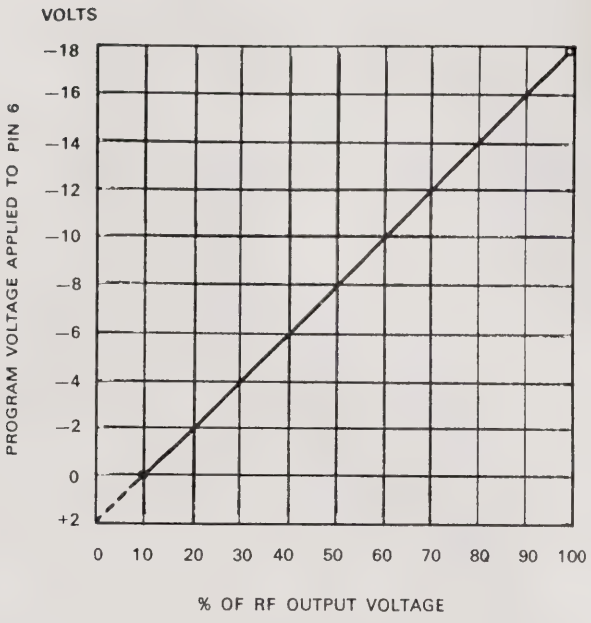
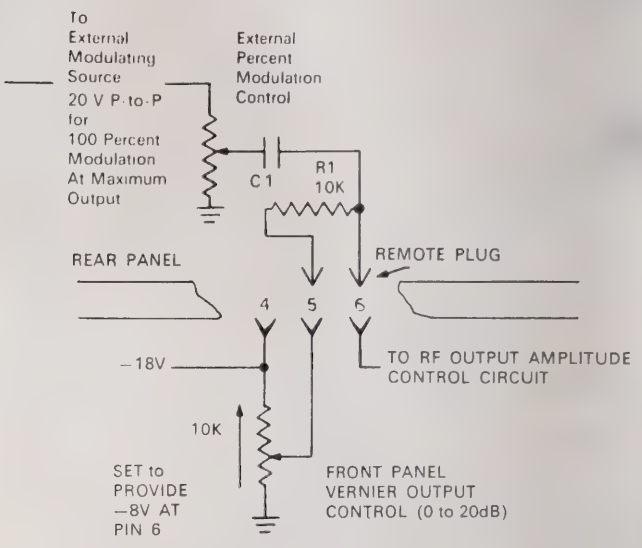


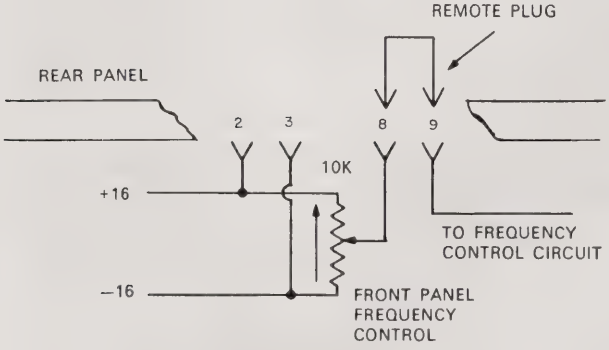
Figure 3-6. Program Voltage/RF Output

To provide AM MODULATION, connect as shown at right. The low frequency modulation will be limited by the reactance of capacitor C1. Lower frequency modulation, down to DC, can be provided with a modulating source having a DC offset. In this case, resistor R1 is omitted. In all cases, the peak modulating voltage plus the DC offset must be within the limits of −18 to +2 volts, as shown in Figure 3-6, or distortion will occur. The modulation frequency limits the maximum usable percentage of modulation as shown in Figure 3-7. This graph was obtained with the DC level set to −8 volts.

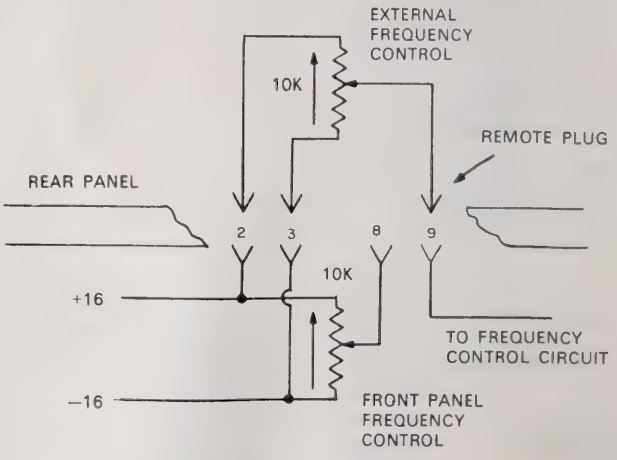


3.6.2 FREQUENCY CONTROL

Normal internal control of frequency is provided by a jumper wire connected between pins 9 and 8 of the REMOTE plug as shown below.



To provide external control, remove the jumper and connect pin 9 to an external Frequency control as shown below. Tuning sensitivity, is shown graphically in Figure 3-8.



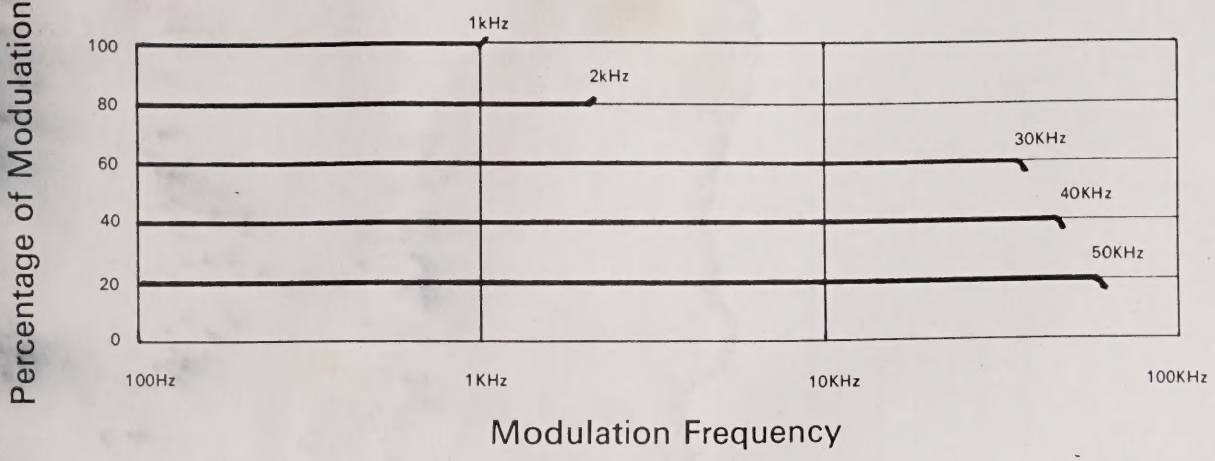
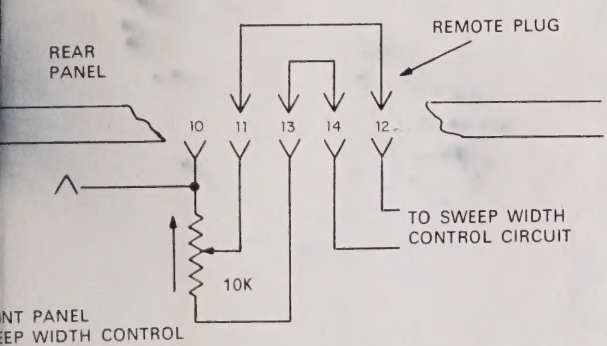


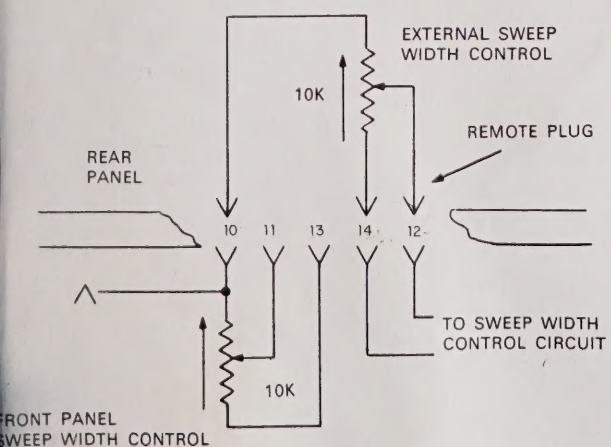
Figure 3-7. Percentage Modulation/Modulating Frequency

3.6.3 SWEEP WIDTH CONTROL (FM Modulation)

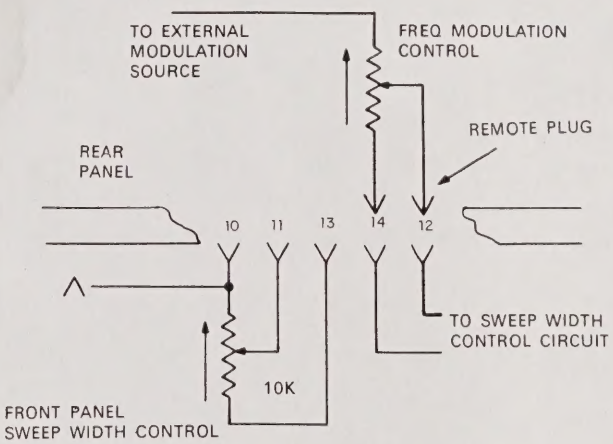
Normal internal control of Sweep Width is provided by a jumper wire from pins 11 to 12 and pins 13 to 14 of the REMOTE plug as shown below.



To provide external control, remove the jumpers and connect pin 12 and 14 to an external Sweep Width control as shown below.



To provide FM modulation, connect as shown below and set the Sweep Width Control for CW operation.



The modulating wave form should have an average potential of zero volts. Frequency sensitivity, is shown graphically in Figure 3-8. The maximum modulating frequency, while still maintaining this sensitivity, varies from approximately 4 kHz at maximum deviation to 20 kHz for 1 MHz deviation. (See Figure 3-9). With decreased frequency sensitivity, frequency up to 200 kHz can be used, as shown in the shaded area of Figure 3-9.

The peak amplitude of the modulating signal plus the DC voltage supplied to the Frequency Control (pin 9 of REMOTE plug) should not exceed + or −16 volts. This amplitude would program the unit to sweep beyond the band limits.

3.6.4 REMOTE TRIGGERING OF SWEEP TIME CIRCUIT

The Sweep Time Circuit can be remotely triggered by applying a 10 volt positive pulse to pin 7 of the REMOTE plug. For proper operation, the Front Panel SWEEP TIME Selector must be set for one of the four variable sweep time positions, and the PULL/TRIG Switch set to its OUT position. The repetition rate of the external trigger should be slower than the free running rate set by the Front Panel SWEEP TIME Selector and VAR/MANUAL Control.

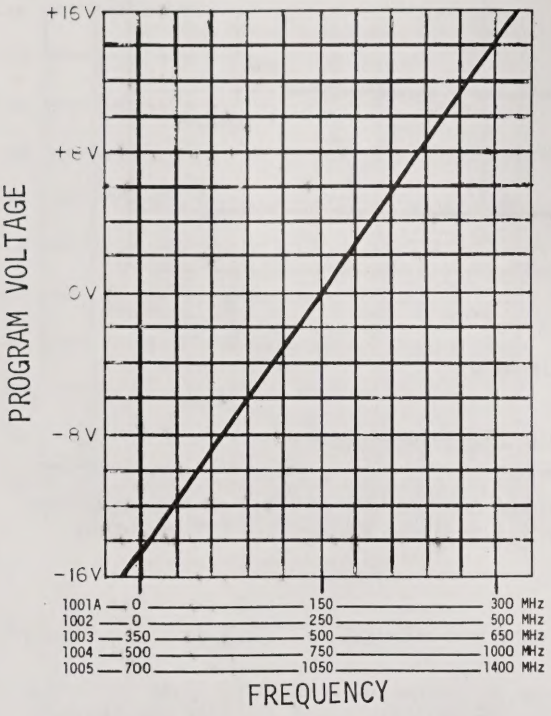


Figure 3-8. Program Voltage (pin 9 or 12)/Frequency

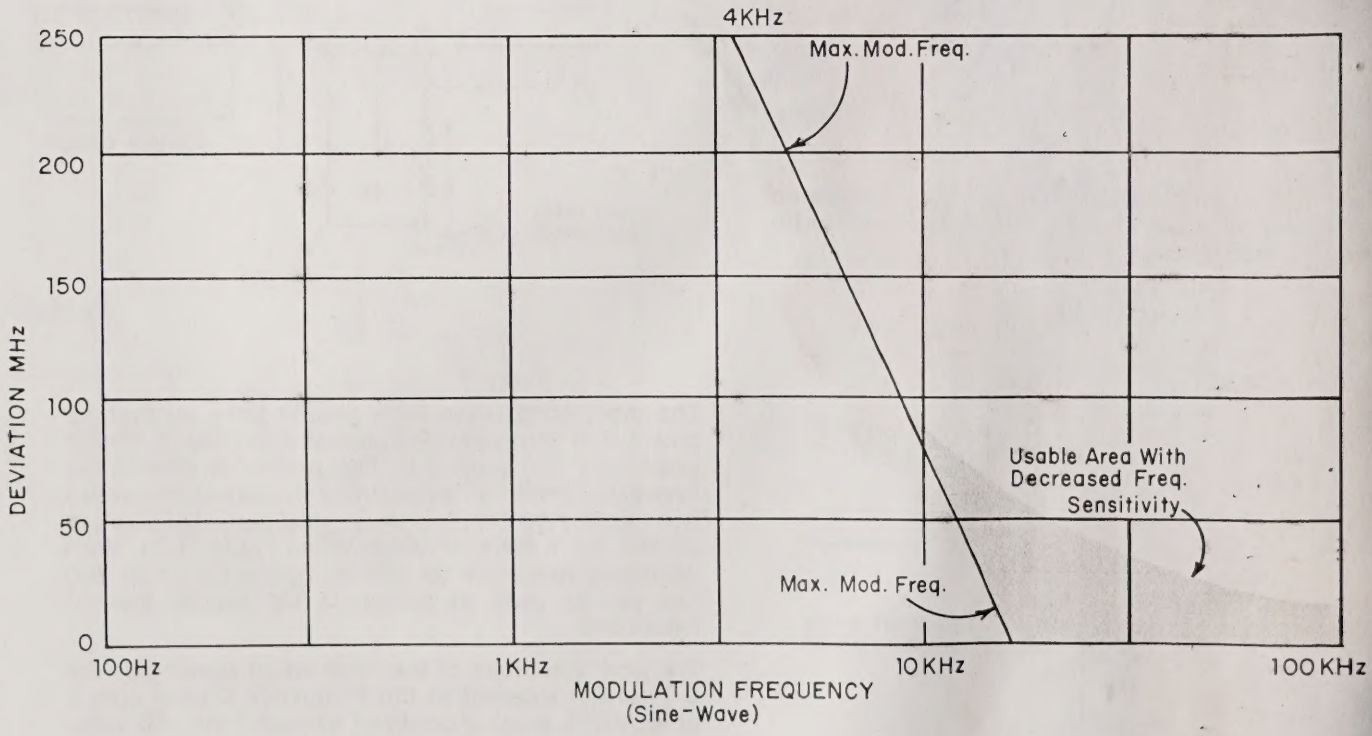


Figure 3-9. FM Modulation Frequency Limits

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